

What is claimed is:

1. A method for using an excimer laser to pattern electrodeposited photoresist on a sloped surface, comprising:

5 depositing a layer of photoresist on top of a substrate that includes a sloped surface; and

scanning an excimer laser beam over the layer of photoresist to expose the layer of photoresist in a desired pattern, wherein the scanning step comprises:

projecting the excimer laser beam in a small beam spot onto the substrate, including the sloped surface; and

10 scanning the small beam spot of the excimer laser beam relative to the substrate to define the pattern sequentially onto the substrate, including the sloped surface.

2. The method of claim 1, wherein the projecting step includes using a mask with an aperture to project the excimer laser beam in the small beam spot onto the substrate, including the sloped surface.

3. The method of claim 2, wherein the scanning the small beam spot step includes moving the substrate underneath a stationary excimer laser beam to define the pattern.

4. The method of claim 2, wherein the scanning the small beam spot step includes moving the excimer laser beam over a stationary substrate to define the pattern.

20 5. The method of claim 2, further comprising adjusting the excimer laser beam using a beamsplitter to reduce transmitted powers of the excimer laser beam so as not to damage the layer of photoresist.

6. The method of claim 1, wherein the projecting step includes using a telescope lens system to form a collimated excimer laser beam to be projected onto the substrate, including the sloped surface.

7. The method of claim 6, wherein the scanning the small beam spot step includes moving the substrate underneath a stationary collimated excimer laser beam to define the pattern.

8. The method of claim 6, wherein the scanning the small beam spot step includes moving the collimated excimer laser beam over a stationary substrate to define the pattern.

9. The method of claim 6, further comprising using a homogenizer to uniformly expose the collimated excimer laser beam across a cross-section of the substrate, including the sloped surface.

10. The method of claim 1, further comprising developing the pattern using developing solutions.

11. An apparatus for using an excimer laser to pattern electrodeposited photoresist on a sloped surface of a substrate, comprising:

5 an excimer laser beam scanned over a layer of photoresist to expose the layer of photoresist in a desired pattern, wherein the layer of photoresist is deposited on top of a substrate that includes a sloped surface;

a mask with an aperture that selects a portion of the excimer laser beam to be projected onto the substrate, including the sloped surface; and

10 a projection lens that projects an image of the aperture as a small beam spot onto the substrate, including the sloped surface,

wherein the pattern is sequentially defined onto the substrate, including the sloped surface, by moving the small beam spot of the excimer laser beam relative to the substrate.

15 ~~11~~. The apparatus of claim 11, further comprising a beamsplitter that adjusts the straight collimated excimer laser beam to reduce transmitted powers of the excimer laser beam so as not to damage the layer of photoresist.

~~12~~. The apparatus of claim 11, wherein the excimer laser beam has a wavelength near optimum absorption wavelengths for photoresist patterning.

20 ~~13~~. The apparatus of claim 11, wherein the projection lens has a long focal length so as to project the excimer laser beam onto the sloped surface in rays that are substantially parallel.

~~14~~. The apparatus of claim 11, wherein the small beam spot of the excimer laser beam has a diameter of as narrow as 10 μm and as wide as several hundred microns.

25 ~~15~~. The apparatus of claim 11, wherein the sloped surface of the substrate is moved underneath a stationary excimer laser beam to define the pattern.

~~16~~. The apparatus of claim 11, wherein the excimer laser beam is moved over a stationary sloped surface of the substrate to define the pattern.

30 ~~17~~. An apparatus for using an excimer laser to pattern electrodeposited photoresist on a sloped surface of a substrate, comprising:

an excimer laser beam scanned over a layer of photoresist to expose the layer of photoresist in a desired pattern, wherein the layer of photoresist is deposited on top of a substrate that includes a sloped surface; and

a telescope lens system that forms a collimated excimer laser beam to be projected onto the substrate, including the sloped surface,

wherein the pattern is sequentially defined onto the substrate, including the sloped surface, by moving the small beam spot of the excimer laser beam relative to the substrate.

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- ~~18~~. The apparatus of claim 17, further comprising one or more homogenizers that uniformly expose the collimated excimer laser beam across a cross-section of the substrate, including the sloped surface.
- ~~19~~. The apparatus of claim 17, wherein the excimer laser beam has a wavelength near optimum absorption wavelengths for photoresist patterning.
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- ~~20~~. The apparatus of claim 17, wherein the small beam spot of the excimer laser beam has a diameter of as narrow as 10 μm and as wide as several hundred microns.

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